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FOOD

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Summary

Diets in India, Japan, and the United States vary greatly in both quantity and composition. Variations arise from a wide assortment of factors, but they are mainly attributable to differences in income and climate. The daily per capita calorie intake averages 2,050 in India, 2,310 in Japan, and 3,180 in the United States. Grain products supply less than one-fourth of the calories consumed in the United States, but nearly two-thirds in the other two countries. Animal products account for less than one-tenth of the calories in Indian and Japanese diets, but about one-third in the United States diet.

Food expenditures account for about three-fifths of per capita income in India, two-fifths in Japan, and one-fifth in the United States. The value of food consumed per person, per day, ranges from \$0.10 in India to \$1.07 in the United States. The pattern of food expenditures varies widely, and the food group representing the largest share of food expenditures differs between the United States and the two less advanced countries. Grain products are most important in India and Japan, and meat in the United States.

Shifts in the level of consumption and in composition of the diet arise largely from changes in per capita income. Immediate changes in the Indian diet are expected to be small because a relatively low rate of economic growth combined with a high rate of population growth restricts gains in per capita income. Diets in the United States also appear to be changing rather slowly at present, but in Japan where the economy is expanding at an unparalleled rate and the rate of population increase is quite low, impressive per capita income gains are producing a rapid rise in the intake of animal products and fruit, while the consumption of starchy foods appears to be declining.

X FOOD CONSUMPTION AND EXPENDITURES:

INDIA, JAPAN, UNITED STATES X

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DETERMINANTS OF FOOD CONSUMPTION PATTERNS

Determinants of food consumption patterns are numerous and often interdependent. They may be divided into five categories: physical, economic, social, religious, and political. The physical and economic factors are usually the most important.

Physical factors such as location, weather, soils, and length of growing season strongly influence the consumption pattern of a country or area through their effect on agricultural production. This influence is strongest in underdeveloped areas where transportation and distribution facilities are limited and where many of the people live at the subsistence level, on locally produced food.

Economic factors interact with the physical environment to play a leading role in shaping the consumption pattern. Unlike physical determinants, economic factors are subject to considerable change; hence, any examination of shifts in food consumption patterns must center on the economic aspects of the consumption environment.

Income levels strongly influence both the composition of the diet and the amount of food consumed. In all countries, a close association seems to exist between per capita incomes and the nutritional quality of the diet. All countries, and especially countries in the same region, tend to have reasonably similar food price structures. Major deviations occur only when trade barriers or transportation costs prohibit the free flow of goods between countries. Starchy foods such as grains, roots, and tubers are virtually always the least costly foodstuffs, whereas meat, milk, eggs, and vegetable oils are the most expensive. As incomes move upward more animal products are purchased and the consumption of starchy foods declines.

Social factors that influence the food consumption pattern also vary greatly among countries. In the United States, concern about being overweight affects what people eat. In Japan, emulation of western ways may cause people to eat more wheat and less rice. The age make-up of the population differs from country to country, with associated differences in food consumption. In industrialized countries like the United States, the continuing shift in the

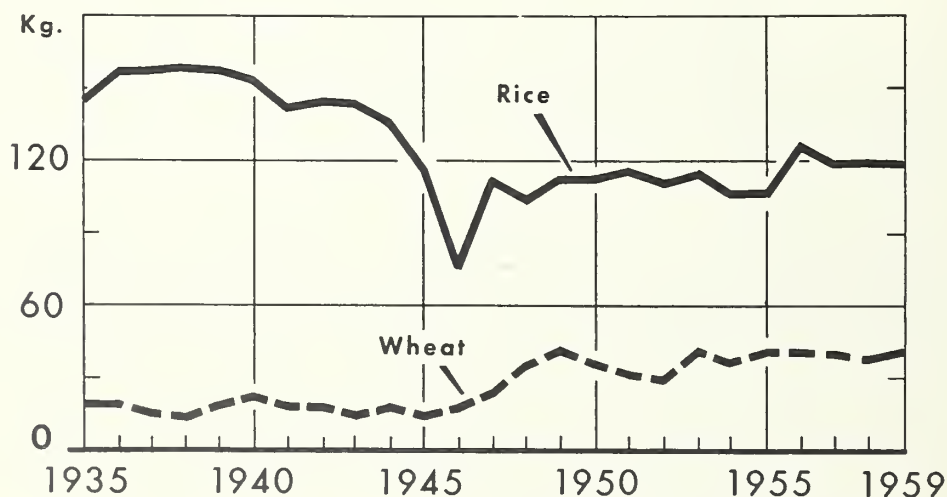
distribution of the labor force from manual to sedentary work has had an effect on diets. This tendency is not likely to be of immediate significance to India, with its slow rate of industrialization, but in Japan the current movement from farm to factory and office is remarkably rapid.

Education, a factor closely associated with the level of living, effects changes in eating habits by developing an appreciation of the relationship between nutrition and general well being.

Religious tenets are among the most rigid of the factors that affect consumption patterns. Most peoples have some religious beliefs concerning food that must be considered in any study of their consumption habits. In India, the inhibitions of most Hindus against eating meat and fish--two of the main sources of animal protein in most diets--set the consumption pattern apart from that of most other countries. Eggs and milk, the alternative sources of animal protein, are eaten by many, though not all, Indians. In the United States, eating habits of some parts of the population, particularly among certain minority groups, are influenced by religious customs.

The effect of political conditions on food intake patterns may be increasing. The Japanese consumption pattern was permanently altered as a result of critical food shortages following World War II and consequent dependence on U.S. wheat (fig. 1) (3). ^{1/} Examples of how political realignments may alter

Japan: Per Capita Annual Consumption of Wheat and Rice



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Figure 1

^{1/} Underscored figures in parentheses refer to items on Literature Cited page.

trade patterns and shift sources of supply can be seen currently in the government-to-government signing of barter and concessional sales agreements. When traditional trade patterns are disrupted, quite different trade patterns may emerge. The loss of territories, partition of countries, and redefining of international boundaries can also cause shifts in food consumption patterns. In the field of international trade, restrictions on the flow of foodstuffs between countries, either in the form of tariffs or import quotas, tend to limit food availability.

COMPARISONS OF FOOD CONSUMPTION PATTERNS

Quantity of Food Consumed

Grain products dominate the diets of Japan and India. Although the overall level of food intake is much lower in both these countries, the per capita use of grain products is more than double that in the United States (table 1). Also, a much greater variety of cereals is consumed than in the United States, where wheat accounts for most grain consumption. In India, rice accounts for one-half of grain consumption; wheat, millets, corn, and barley make up the remainder. In Japan, rice accounts for two-thirds of total cereal intake, and wheat and barley for one-third.

Traditional dependence on white potatoes puts the United States much higher than India but considerably lower than Japan in consumption of roots and tubers. Indians consume about equal quantities of potatoes (white and sweet) and cassava. However, as cassava ranks very low on the consumer scale of preferences, its use will likely decline as incomes improve. Japanese eat both white potatoes and sweetpotatoes, but white potatoes are preferred.

India and Japan use comparatively large quantities of pulses, a rich source of vegetable protein and a partial substitute for animal protein. In both countries, the consumption of pulses is increasing with improvement in incomes. In the United States, the use of pulses (mostly beans and peas) is declining as incomes rise.

Fruit and vegetable consumption in the United States is more than three times that in India and well over twice as high as in Japan. Advanced methods of handling, processing, transporting, and storing perishable foods, reduce reliance on seasonal availability and thus contribute much to the greater use of these foods by U. S. consumers. The consumption of sugar and fats and oils, frequently a good indication of the level of living, is much higher in the United States than in either of the other countries.

On the average, Americans consume slightly less fish than Indians, and only about one-eighth as much as Japanese. Fish is an excellent source of animal protein, and in land-scarce Japan it occupies a strategic position in the diet.

In per capita meat consumption, the United States is so much higher than either India or Japan that it scarcely provides a basis for comparison. The U. S. per capita consumption of poultry alone considerably exceeds the total per capita intake of all meats in either India or Japan. The extraordinarily high consumption of meat is illustrated by the fact that Americans have consumed much more meat than bread each year since the end of World War II.

Table 1.--Food consumption per capita: Estimates for India, Japan, and the United States, 1958

Food	India	Japan	United States
	-----Pounds-----		
Grain products.....	304.9	344.6	149.2
Roots and tubers.....	22.0	173.3	<u>1</u> /114.3
Pulses.....	<u>2</u> /50.9	<u>3</u> /28.9	<u>4</u> /8.2
Fruits, nuts, and vegetables..	<u>5</u> /146.2	208.6	491.6
Sugar.....	28.0	32.2	101.8
Fats and oils.....	11.0	7.9	<u>6</u> /40.4
Fish.....	13.4	88.2	10.6
Meat including poultry <u>7</u> /.....	3.1	9.0	185.7
Milk and milk products <u>8</u> /.....	<u>9</u> /72.3	<u>9</u> /31.7	<u>10</u> /680.2
Eggs.....	.4	8.8	46.3

1/ White potatoes and sweetpotatoes only.

2/ Includes peanuts consumed as food.

3/ Includes soybeans and soybean meal consumed as food.

4/ Dried peas and beans only.

5/ Includes coconuts consumed fresh.

6/ Excludes butter.

7/ Carcass weight.

8/ Whole milk equivalent.

9/ Excludes butter.

10/ Includes whole milk equivalent of butter.

Note: Consumption in India and Japan is measured on a farm-weight equivalent basis. U. S. consumption is measured at various levels depending upon the food group.

Source: Data for India and Japan are taken from (3) p. 43; U. S. data is from (1) tables 8-26.

Milk consumption also is quite low in both India and Japan. Americans use nearly a quart of milk per day, much of it in the form of butter, cheese, and ice cream. Indians average only a quart every 12 days, and in Japan, average consumption is little more than a quart per month.

For eggs, too, the difference in average consumption is striking. In the United States the average is almost one egg per day, whereas in Japan it is more nearly one egg per week and in India only about three eggs per year. At least part of the low egg consumption in India is attributable to religious inhibitions concerning the use of animal products.

Source of Calories

From the standpoint of source of calories, perhaps the outstanding difference between the United States and the other two countries is the preponderance of starchy foods in the Indian and Japanese diets and the relative lack of starches in the U. S. diet (table 2, fig. 2). Grain products alone provide about two-thirds of all calories consumed in India and Japan, and if roots and tubers are added, the percentages are 68 and 75 percent, respectively. In the

United States, by contrast, only one-fifth of total calories are obtained from grain products, and less than one-fourth from grain products plus roots and tubers. Even at the beginning of this century when U.S. living standards were much lower and diets were quite starchy by present standards, grain products provided only 37 percent of the total calories consumed. Americans currently derive as many calories from the consumption of fats and oils as from grain products.

The distribution of calories according to food groups is likely one of the best criteria for evaluating the quality of diets. In the United States, four food groups other than grain products--sugar, fats and oils, meat, and milk products--each contribute well over 10 percent of total calories. In Japan and India, however, scarcely any group other than grain products provides 10 percent of the total.

The calories derived from all animal products, including fish, amount to just under 100 per person per day in India, about 135 in Japan, and nearly 1,000 in the United States.

Table 2.--Calories consumed per capita per day: Amount and percentage contributed by food groups, India, Japan, and the United States, 1958

Food group	India		Japan		United States	
	Calories	Percent	Calories	Percent	Calories	Percent
Grain products.....	1,334	65.1	1,541	66.7	667	21.1
Roots and tubers.....	59	2.9	189	8.2	<u>1</u> /98	3.1
Pulses.....	225	11.0	116	5.0	<u>2</u> /101	3.2
Fruits, nuts, and vegetables	<u>3</u> /82	4.0	<u>3</u> /81	3.5	<u>4</u> /193	6.1
Sugar.....	129	6.3	155	6.7	499	15.8
Fats and oils <u>5</u> /.....	129	6.3	95	4.1	645	20.4
Fish.....	10	.5	69	3.0	7	.2
Meat and poultry.....	4	.2	25	1.1	432	13.7
Milk and milk products <u>6</u> /...	76	3.7	25	1.1	439	13.9
Eggs.....	2	<u>7</u> /	14	.6	79	2.5
Total.....	2,050	100.0	2,310	100.0	3,160	100.0

1/ White potatoes and sweetpotatoes only.

2/ Also includes nuts, soya flour, and cocoa.

3/ Includes coconuts eaten fresh.

4/ Excludes nuts.

5/ Includes butter and ghee, but excludes invisible fat.

6/ Excludes butter.

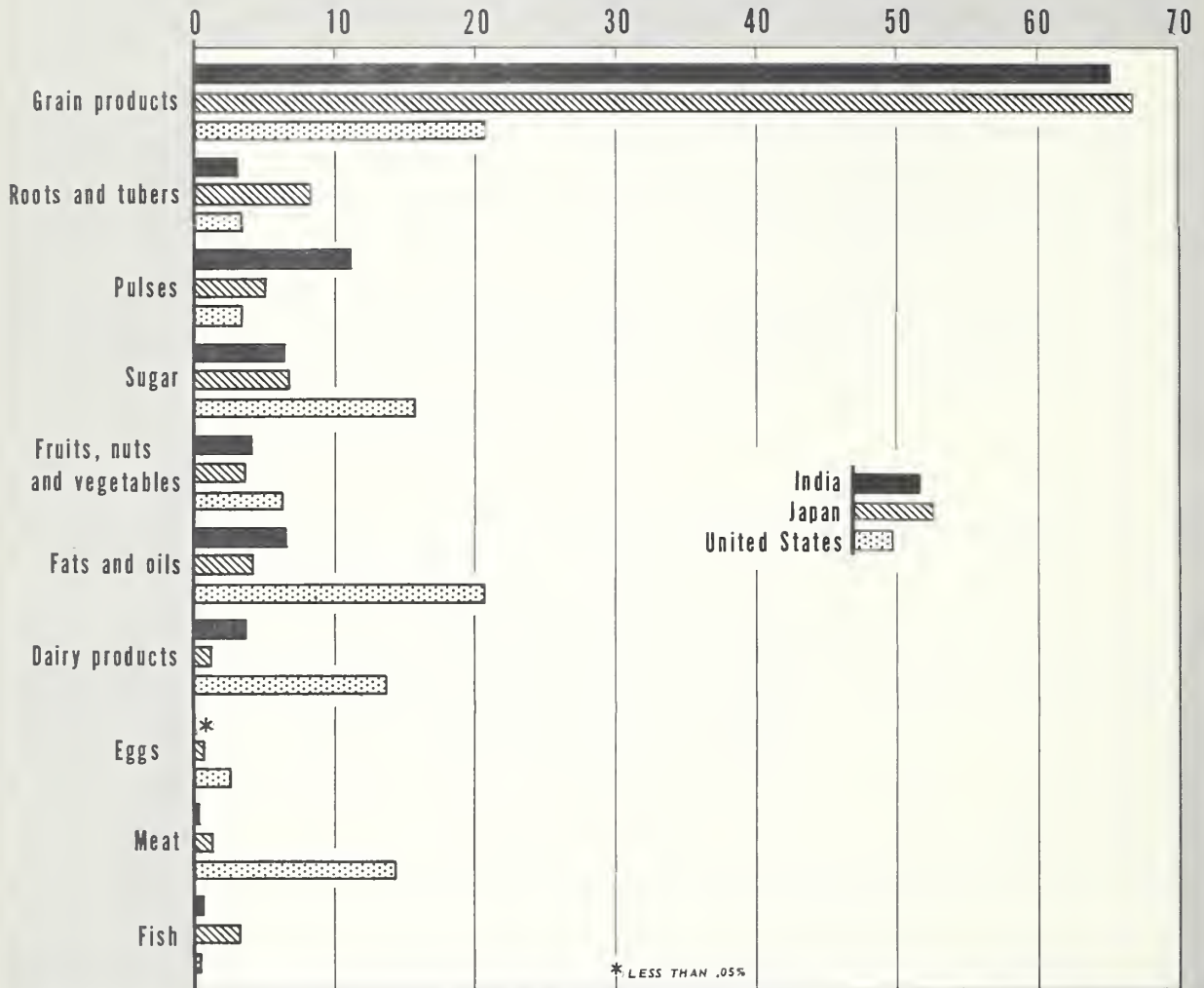
7/ Less than 0.05 percent.

Source: Data for India and Japan are taken from (7). Data for the U. S. are taken from (1) table 47.

Source of Calories in Diet

India, Japan, and U. S., 1958

PERCENT OF TOTAL CALORIE INTAKE



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Figure 2

EXPENDITURES FOR FOOD

Per Capita Expenditures^{2/}

Food expenditures per person vary greatly from country to country. For example, the average Indian spends less than 10 percent as much on food as the average American (table 3). The share of total income spent for food varies

^{2/} Expenditures-for-food refers to the market value of all food consumed and thus includes home-produced food consumed on the farm.

from roughly three-fifths in India to two-fifths in Japan and one-fifth in the United States. 3/

Considering expenditures in terms of labor requirements, a worker in the United States spends his wages from 1 day of a 5-day work-week for food. A Japanese worker spends 2 days' wages and an Indian worker 3 days' wages for food. It should be pointed out, however, that workers produce much more per day in some countries than in others because they are more skilled or because their productive capacity is enhanced by larger complements of capital in the form of machinery. Higher food expenditures by Americans reflect many differences such as an overall greater calorie intake; greater variety in the diet; a markedly larger share of costly animal products such as milk, meat, and eggs; and many more services in the form of packaging, processing, and transporting.

Table 3.--Relationship between per capita income and expenditures for food; India, Japan, and the United States, 1958

Country	Per capita		Percentage of income spent on food
	Food expenditures <u>1/</u>	Total income <u>2/</u>	
	<u>Dollars</u>	<u>Dollars</u>	<u>Percent</u>
India.....	36	63	<u>3/</u> 57
Japan.....	94	258	<u>4/</u> 36
United States.....	<u>5/</u> 387	2,069	19

1/ Expenditure for food refers to the market value of all food consumed and thus includes home produced food consumed on the farm.

2/ (14)

3/ (9) p. 183

4/ (12) p. 371

5/ (1) p. 57

Expenditures by Food Group

The food group allocated the largest share of income is not the same in all three countries (table 4). Indians spend 61 percent of all their food money on grain--rice, wheat, and the minor cereals; the Japanese allot 56 percent of their food budget for the purchase of grains, but U. S. consumers spend more money on meats than on any other group of foods.4/ The American consumption pattern shows by far a more even distribution; five groups each account for more than 10 percent of total food expenditures; this compares with only one group in both Japan and India.

Perhaps the best single indicator of the quality of a diet is the percentage of food expenditures allocated to the starchy food staples. United States consumers can purchase all the starchy food they require with only 12 percent of their food budget, whereas in Japan and India 58 and 61 percent of the food

3/ Income includes both money and non-money income.

4/ Expenditures for food refers to the market value of all food consumed and thus includes home produced food consumed on the farm.

Table 4.--Distribution of food expenditures by food groups: India, Japan, and the United States

Food group	India ^{1/}	Japan ^{2/}	United States ^{3/}
Grain products.....	61.1	55.7	10.2
Roots and tubers	<u>4/</u>	2.2	2.1
Pulses	<u>6.0</u>	<u>1.7</u>	<u>5/</u>
Fruits, nuts & vegetables..	5.6	<u>6/</u> 7.1	16.8
Sugar	<u>7/</u> 6.8	<u>4/</u>	3.2
Fats and oils	3.6	<u>9.7</u>	4.4
Fish .....	(	6.8	2.9
Meat and poultry.....	(3.6	(	28.5
Eggs.....	(	( 5.3	4.0
Milk and milk products.....	11.0	(	15.0
Other.....	2.3	<u>8/</u> 11.5	<u>9/</u> 12.9
Total	100.0	100.0	100.0

^{1/} Based on data collected by the National Sample Survey (1952) as presented in table 19 of (5).

^{2/} Based on data collected in a 1957 survey as presented on page 195 of (11).

^{3/} Based on household consumption data collected in spring 1955 (2).

^{4/} Included in other.

^{5/} Pulses included in fruits and vegetables.

^{6/} Vegetables only, fruit and nuts included in other.

^{7/} Also includes salt and spices.

^{8/} Largely cakes, fruits, tea, and other non-alcoholic beverages.

^{9/} Largely non-alcoholic beverages.

Note: Expenditures for food refers to the market value of all food consumed and thus includes home produced food consumed on the farm.

budget goes for starchy food. When related to total per capita income, this contrast is even more striking. Two percent of per capita income is required in the United States to purchase traditional food staples (largely bread and potatoes); in Japan about one-fourth of per capita disposable income is spent for starchy staples (mostly rice, but also wheat, barley, and potatoes); and in India just over one-third of per capita income is spent for staples (rice, wheat, and minor cereals).

The proportion of the food budget allotted to the four food groups that provide animal protein--fish, meat, milk and milk products, and eggs--varies widely between the United States and the other two countries. In the United States, the animal protein group accounts for 50 percent of total food expenditures, in Japan 12 percent, and in India 14 percent. Meat takes a large part of the expenditures for animal protein foods in the United States, but in Japan fish completely dominates and in India milk and milk products overshadow all other animal protein foods.

Differences in urban-rural consumption patterns

Urban-rural food consumption differences are more pronounced in low income countries. Urban consumers in India spend only 21 percent of their food money on grains whereas rural consumers with much lower incomes, use an average of 41 percent of their food budget for grains. Indians living in urban areas purchase correspondingly more of the costly foods such as milk, meat, eggs, fish, vegetable oils, fruit and nuts (5).

Differences exist between the food expenditure and consumption patterns of farm and non-farm families in Japan, but they are not striking. Income levels are lower in rural areas but the share of income spent for food is somewhat larger. Urban dwellers consume less rice, but more wheat. They also consume more of the animal protein foods such as meat, milk, eggs, and fish (13).

Food consumption disparities between the rural and urban population are not large in the United States. Consumption levels of some food groups such as pork, fish, and fresh fruit are the same in the urban, rural non-farm, and rural farm segments of the population. In most other food groups, small, but not striking, variations occur between per capita consumption levels in the three segments. Grain products are consumed in larger quantities by the rural population, both farm and non-farm. Per capita consumption of some animal protein foods, such as beef and poultry is slightly higher in urban areas. Other animal products, namely milk and eggs are consumed in larger quantities by the farm population. On balance, differences between urban and rural diets appear to be minimal and declining (8).

ENERGY INTAKE AND COST PER UNIT OF INTAKE

The average U. S. diet contains 54 percent more calories than the average Indian diet and 37 percent more than the average Japanese diet. In terms of minimum recommended levels (2,300 calories per person per day for both India and Japan and 2,640 for the United States), the Indian per capita calorie intake is about 11 percent below standard, the Japanese intake is less than one percent above, and the U. S. intake is 20 percent above.

The higher calorie requirement in the United States arises largely from differences in physical stature, age and sex composition of the population, and climate. Americans are much taller and heavier and hence have higher body maintenance and energy requirements. Also, the United States has generally lower temperatures than the other two countries, and this increases the amount of food energy required to maintain body temperatures.

For each 1,000 calories in his diet, a U. S. consumer spends over 3 times as much as a Japanese consumer and nearly 7 times as much as an Indian consumer. This difference reflects many things, including more services and a greater variety of food, but more than anything else it reflects a much greater consumption of costly, high protein animal products.

Table 5.--Food costs per energy unit: India, Japan, and the United States, 1958

Country	Daily energy intake	Daily food expenditures	Cost per 1,000 calories
	<u>Calories</u>	<u>Dollars</u>	<u>Dollars</u>
India.....	2,050	0.10	0.05
Japan.....	2,310	.26	.11
United States.....	3,160	1.06	.34

Derived from tables 2 and 3.

FUTURE TRENDS IN FOOD CONSUMPTION

Many factors affect per capita consumption trends. The most important is income, especially changes in income. Other factors, usually less predictable, are prices, changing tastes, nutritional education, and availability as determined by distribution facilities, trade restrictions, etc. Population growth affects per capita consumption only indirectly as it influences per capita food availabilities and income.

Income and Consumption Relationships

The relationship between changes in income and changes in consumption of particular foods is measured by income elasticity coefficients of demand. These coefficients may be measured either by means of cross sectional or time series data, the choice often being determined by which is available. A positive coefficient indicates that consumption of a particular food will rise as income rises. If the coefficient is greater than 1, consumption will rise faster than income. A negative coefficient indicates a decline in consumption as incomes rise.

The United States in Retrospect

A look at food consumption trends in the United States over the past half century should provide some indications as to expected trends in India and Japan. Shifts in the consumption patterns of these countries will not be identical with those that have occurred in the United States, but they are likely to be somewhat similar. In all three countries the consumption of animal protein foods will trend upward (fig. 4). The per capita intake of nearly all starchy foods is declining in the United States (fig. 3) and Japan, while in India some of the favored starchy foods, especially wheat, are still trending upward.

A basic difference is seen in the fact that whereas U. S. consumers started from a high calorie intake level (about 3,500 per capita per day in 1910) and gradually reduced this, consumers in the two Asian countries will be starting at a low level and gradually raising it.

The share of income spent for food by U. S. consumers has remained rather steady at about 20 percent over the last few decades. This has occurred, not because the quantity of food consumed has increased commensurately with income, but because the value of food at the retail level has been rising steadily as quality has improved and as more services in the form of processing, packaging, and preparation have been included in the final product.

Per Capita Consumption of Starchy Foods, U. S.

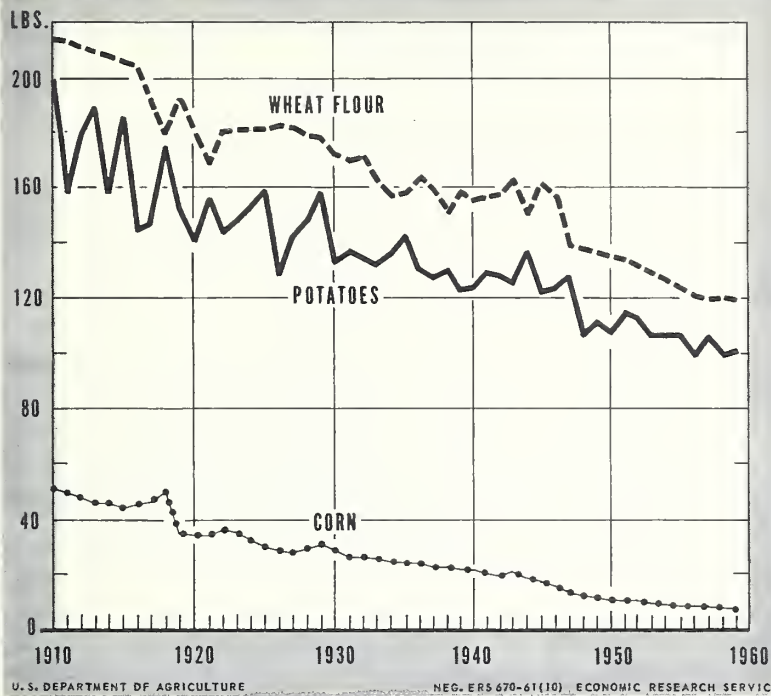


Figure 3

Per Capita Consumption of Animal Products, U. S.

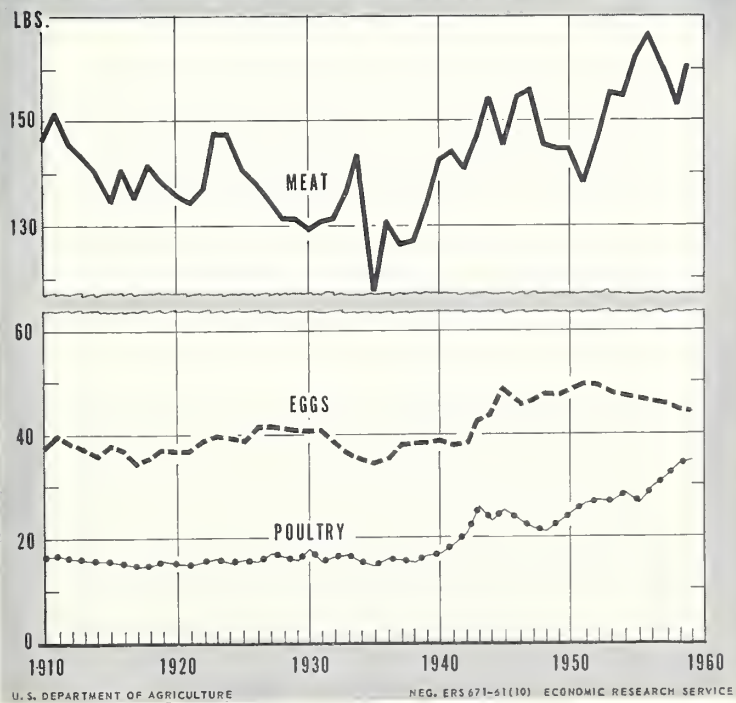


Figure 4

Table 6.--Income elasticity coefficients of demand for selected foods,
United States^{1/}

Food	Income elasticity coefficient	Food	Income elasticity coefficient
Wheat and flour.....	-0.20	Fruits:	
White potatoes and sweetpotatoes.....	- .25	Citrus.....	.65
Dry beans and peas.....	- .20	Other.....	.13
Sugar.....	- .07	All fruit.....	.32
Fats and oils.....	.06	Meat:	
Vegetables:		Beef.....	.40
Tomatoes.....	.40	Pork.....	.20
Leafy, green and yellow.	.25	Poultry.....	.30
Other vegetables.....	.20	Eggs.....	.15
All vegetables.....	.25	Fluid milk and cream.....	.12

^{1/} These elasticities were assumed on the basis of statistical evidence, trend influences, and judgments relating to other factors. Thus, some elasticities are implied by projected consumption.

Source: (6), p. 80.

India

The aggregate income elasticity of demand for foodstuffs in India appears to be close to unity. The coefficient of demand for peanut oil, which is the leading edible oil, is 1.72, and the coefficients of demand for the major cereals, rice and wheat, are +0.16 and +1.25, respectively. These coefficients for rice and wheat are, as is to be expected, higher than in Japan where both rice and wheat have coefficients of +0.1 or in the United States where the principal cereal, wheat flour, has a coefficient of -0.2.

In India, the coefficients of demand for food are generally lower in urban areas. Nearly all staple foods have positive coefficients of demand except for a few minor cereals that have coefficients between 0 and -1.0. This means that as incomes rise, per capita consumption of most major foods will rise, with consumption of wheat and vegetable oils rising most rapidly. Rice intake will increase only gradually, and the consumption of less desirable minor cereals, such as jowar, is expected to decline.

It is not likely that either the percentage of income spent for food in India or the pattern of food consumption will change greatly in the immediate future. With the existing low level of consumption and the strong demand indicated by the demand coefficients, a large share of any additional income will be spent for food. Any shift in the food intake pattern depends on a change in per capita income, and per capita income is unlikely to change greatly because the high rate of population growth will partly offset the expected modest expansion in national income. Also, deeply ingrained religious inhibitions concerning the use of animal products make for rather inflexible food habits. All things considered, the Indian food utilization pattern has been much more rigid than that of either Japan or the United States.

Table 7.--Income elasticity coefficients of demand for selected foods, India, based on 1949-58 data

Food	Income elasticity coefficient
Major cereals:	
Rice.....	0.16
Wheat.....	1.25
Other cereals and pulses:	
Gram (pulse).....	0.53
Jowar (sorghum).....	-0.40
Edible oils:	
Peanut oil.....	1.72
Mustard oil.....	1.02

Source: All coefficients estimated by National Council of Applied Economic Research (New Delhi, India) from time series data 1948-49 to 1957-58 except those for gram and jowar, which are based on a household consumption survey conducted by the Council.

Japan

In Japan, rapidly rising per capita incomes coupled with high income elasticity coefficients of demand for several foods will probably result in much more pronounced changes in the consumption pattern than will occur in either India or the United States (table 8). The consumption of rice and wheat is likely to remain virtually constant as incomes rise, since the coefficient of demand for both is +0.1. Barley and sweetpotatoes are now staple foods, but with demand coefficients of -0.6 and -1.2 they rate very low on the consumer preference scale, and their use as food is expected to decline sharply.

Table 8.--Income elasticity coefficients of demand, selected foods, Japan, based on 1951-56 data

Food	Income elasticity coefficient	Food	Income elasticity coefficient
Rice	0.1	Vegetables	0.3
Barley, polished	- .6	Meat	1.2
Wheat .....	.1	Eggs	2.0
Sweetpotatoes	-1.2	Milk and milk products ..	3.0
White potatoes	- .1	Butter	1.8
Soybeans ^{1/}.....	.2	Edible fats and oils	1.7
Other pulses .....	.0	Sugar .....	.5
Fruits	1.2		

^{1/} Includes adzuki beans

Source: "Estimation of Demands for Food" document submitted by the Japanese Government to the third session of the Economic Commission for Asia and the Far East Working Party on Economic Development and Planning; and "Reference Tables for the Agriculture, Forestry and Fisheries Sections of the New Long Term Economic Development Plan" (in Japanese).

Several foods--fruits, fats and oils, and animal products such as meat, milk, eggs, and butter--have income elasticity coefficients of demand greater than +1.0. Consumption of these commodities, then, is likely to grow even faster than incomes. If these high coefficients should apply throughout the current decade and if the government's plan to double national income by 1970 should be successful, per capita consumption of these commodities may be expected to increase sharply.

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